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ANALGESIA AND ANESTHESIA IN OBSTETRICS * †

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The current multiplicity of agents and methods for obstetric analgesia and anesthetia indicates a lack of uniform plan of action for this phase of obstetric practice. During the search for the ideal agent and method, three tendencies have appeared: first, the local acceptance of a pattern of analgesia and anesthetia, followed by the attempt to apply it to all obstetric problems arising thereafter; second, an initial unwarranted enthusiasm which leads to the exploitation of a new agent or method by those whose basic qualifications are inadequate; and third, the indifferent employment of varying techniques within one locale rather than the direction of efforts toward evolution of a program applicable to a wide variety of cases.

The principal concern of both obstetrician and anesthetist is the safety of the mother and her baby. Careful alleviation of pain during the ordeal of labor and delivery requires formulation of a program in the prenatal period based on evaluation of the patient as an anesthetic and obstetric risk. This study of the patient will comprise her mental outlook toward pregnancy and labor, her reaction to the usual travail of pregnancy, and her general physical status. An untoward development during the latter part of gestation will require alteration of the outline of care at term; however, further evaluation of the patient at that time will materially assist in solution of such a problem. The ultimate well-being of both mother and baby requires the judicious selection of analgesic and anesthetic agents; this can be accomplished more readily by concerted action of the obstetrician and anesthetist.

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MORPHINE

The opiates have largely been replaced by the less depressant analgesic drugs. Morphine is considered contraindicated if delivery is expected within four hours. The ready passage of the drug across the placental barrier may result in the birth of an anephic baby if delivery occurs within that period. For primiparas, the use of morphine to provide rest and conservation of strength during a long and arduous labor may be justifiable; for multiparas, the use of drugs other than morphine is recommended because the time of delivery is difficult to estimate.

Morphine causes a reduction of intensity of fetal respiratory movements and, in inmoderate doses, may abolish them (1). There is reason to believe that morphine will cause a decrease in functional efficiency of the labor mechanism, with attendant increase in mortality and morbidity of the fetus. Krebs et al. (2) related that a combination of morphine and scopolamine appreciably shortened the first stage of labor and caused a small but significant increase in the length of the second stage. Complete amnesia was realized in 80 per cent to 85 per cent of parturient patients. Seminarcosis with these agents caused no increase in the incidence of fetal asphyxia. The substitution of barbiturates for morphine in the morphine-scopolamine medication, however, brought about a striking decrease in fetal mortality. Clifford (3) determined that the administration of morphine to the mother within four hours of delivery caused a pronounced (two-fold) increase of neonatal mortality among premature infants. The incidence of fetal deaths in this group rose as the dose of morphine was increased. The greatest fetal loss occurred in the group delivered by cesarean section in the presence of decompensated heart disease.

Morphine is recommended in the treatment of pulmonary edema which may develop during labor as a complication of severe cardiac disease. Definite improvement in the cardiac status was noted by Mendelson and Pardee (4) following the use of morphine, digitalis and oxygen for cardiac decompensation within this period.

DEMEROL

The recent interest in demerol has led to an increase in employment of this drug for obstetric analgesia. In therapeutic dosage, this agent is able to produce analgesia without the significant depressant effect caused by morphine (5, 6). Larger doses produce a degree of sedation which enables the parturient patient to sleep between pains. The average effect obtained is that of relief of pain and apprehension, attended by a mild degree of euphoria; little amnesia is observed following the use of demerol alone. Therapeutic doses are reported to produce neither alteration of the rhythmical contractions of the uterus nor
delay of progress of labor. Clinical experience would seem to indicate that the length of labor is significantly reduced (7, 8). There is no reason to believe that any untoward depressant effect on the fetus exists in the doses employed. Schumann has extended the use of demerol to include those patients delivered by cesarean section. No limit of probable time interval between administration of demerol and subsequent delivery has been stipulated. Doses are repeated at three hour or four hour intervals, depending on the expected time of delivery and the reaction of the individual patient.

The side effects of the drug are minimal following administration by the subcutaneous and intramuscular routes. The intravenous route of injection is attended by more rapid and more positive evidence of untoward effects, the most constant of which are nausea and vomiting. These may be rendered infrequent by slow intravenous injection.

Because demerol alone produces no significant degree of amnesia in the doses employed, it has been administered with scopolamine (5), the barbiturates (8) and other amnesic agents. The combination of demerol and scopolamine is reported to be unsurpassed by other agents or combinations in use at present.

The possibility of idiosyncrasy to either of these agents or to the combination must be observed. Steinberg (9) has recently reported 4 cases of marked uvular and glottic edema following the administration of demerol with scopolamine.

**Barbiturates**

The employment of members of the barbiturate group for obstetric analgesia has become a well-established practice. Beratti (10) demonstrated the permeability of the placenta to several of these preparations. Following their administration to the mother, the various derivatives appear in the fetal circulation within fifteen minutes to one hour. The placenta is apparently less permeable to the short-acting barbiturates. The members of the barbiturate series have been variously reported to cause a decrease in efficiency of uterine contractions and a delay in spontaneous respiration of the infant. These complications are generally observed following the use of excessive doses of these agents.

Sodium amytal enjoys a consistent popularity for obstetric amnesia and analgesia. Swendson (11) reported that satisfactory amnesia may be expected in 9 of 10 cases by use of the intravenous route of administration if the doses of sodium amytal and the intervals between injections are individualized. Lewis and Hamilton (12) observed the production of complete amnesia with this drug in 83 per cent of cases, with no untoward effects on mother or child. Littell (13) stated that no ill effect on the newborn child is sustained if sodium amytal is administered in safe doses to the mother. Lewis (14) observed the
effects of the following combinations of analgesic agents on the
newborn child: morphine and scopolamine; morphine, scopolamine and
sodium amytal; sodium amytal as the sole agent; and nitrous oxide-

degases oxygen for intermittent analgesia prior to delivery and for anesthesia
at termination of the second stage of labor. The lowest incidence
of narcotic effect on the infant appeared in that group in which only
sodium amytal had been employed for analgesia.

Pentobarbital sodium is at present extensively employed for ob-
steric purposes, usually in conjunction with another amnestic agent.
The favorite adjunct is scopolamine. Irving et al. (15) observed that
the combination of pentobarbital sodium and scopolamine was the most
satisfactory of those technics reported. The chief objection to the
method was restlessness, the incidence of which varied from 17 per
cent to 50 per cent. Boylan (16) found this combination superior to
pentobarbital sodium alone. Danforth (17) stated that proper anal-
gesia with pentobarbital sodium shortened the period of labor of
primiparae about two and one-half hours. Clifford (3) observed that
the general use of pentobarbital sodium and scopolamine caused an
appreciable decrease in the incidence of operative delivery. After
relief of pain, labor was permitted to progress to normal delivery. In
1935, Hunt (18) reported the results of a questionnaire from which it
was ascertained that barbiturate derivatives were being used exten-
sively, with scopolamine the common adjunct. The barbiturates
were believed to have no serious effect upon mother and infant. Dil-
itation of the cervix was apparently accelerated. The answers to the
questionnaire indicated a more frequent substitution of the bar-
biturates for morphine in the combination with scopolamine. Pen-
tobarbital sodium appeared more frequently as the barbiturate of choice.
Gould and Hirst (19) reported in 1935 also that the barbiturates were
the most widely used agents, of which pentobarbital sodium was the
more popular in a majority of clinics. McNeal et al. (20) were of the
opinion that the use of pentobarbital sodium should be confined to hos-
pital practice.

The ultra-short-acting barbiturates have had only moderate popu-
ularity for obstetric analgesia and anesthesia. Both evipal soluble and
pentothal sodium have been employed by the oral, intravenous, intra-
muscular and rectal routes. According to Adams (21), the use of
evipal soluble has been practically abandoned. However, Thoms and
Taylor (22), in a report published in 1942, commented upon the effect-
iveness of the combination of evipal soluble (rectal) and scopolamine
(oral). The analgesic effect appeared within five to ten minutes of
administration and persisted for six hours. The amnesia produced ap-
parently bore no relation to the effectiveness of analgesia. No sig-
nificant differences in effect of the fetus were revealed when this
method was compared to others used in the same study. Pentothal
sodium is at present seldom used for amnesia or analgesia, but is
occasionally employed for cesarean section. In the latter instance, it is generally preferred that pentothal be supplemented by another agent or method: e.g., nitrous oxide and oxygen, abdominal block or local infiltration. One of the major objections to the use of either barbiturate during labor is the need for frequent administration of the drug if the intravenous route is used. Landy (23) recommended pentothal sodium for cesarean section only; if the agent is used for nonoperative obstetrics, the dose should be small and intended only for purposes of induction. He believed that a dose sufficiently small to avoid depression of respiratory function of the baby is insufficient for these latter procedures. Hollman (24) stated that a negligible amount of pentothal sodium can be recovered from the blood of the newborn infant if delivery is completed within five minutes following induction with the agent. The concentration of pentothal in the blood of the umbilical vein of the fetus rises in linear fashion to equal that in maternal blood within twelve minutes.

If the administration of pentothal sodium be delayed until delivery is imminent, vaginal and rapid abdominal deliveries may be performed before appreciable amounts of the drug have been transmitted to the fetus.

**Analgesic Agents Administered by the Rectal Route**

Two preparations administered by the rectal route are still extensively employed. Mixtures of ether and oil or ether, paraldehyde and oil in conjunction with pentobarbital sodium have been advocated by the Obstetrical Department of the Indiana University School of Medicine (25). Morphine sulfate is occasionally administered if labor is protracted, but it is never given within four hours of the anticipated time of delivery. The ether and oil combinations employed elsewhere are usually modifications of the original Gwathmey technic, in which analgesia and anesthesia are completed with supplemental drugs.

Kane and Roth (26) advocated the combination of paraldehyde and benzyl alcohol. Oil was eliminated from the mixture because of its retarding effect on the absorption of paraldehyde through the rectal mucosa; small amounts of benzyl alcohol (1.5 cc.) were added to provide analgesia of the mucous membrane during the phase of absorption. The instillations were repeated when necessary during the course of labor. The method was deemed useless if labor lasted less than four hours since, in this instance, there was insufficient time to establish a satisfactory degree of amnesia and analgesia. Careful technic and attention to details produced both complete amnesia and total relief from pain of labor in nearly 90 per cent of the cases studied. In 7.7 per cent of the total group, no relief was obtained; the greater proportion of patients in this subdivision were in labor less than four hours. The incidence of fetal deaths, including those due to stillbirth and pre-
maturity, was 3.3 per cent. Rosenfield and Davidoff (27) reported the attainment of complete analgesia in 95 per cent of those cases in which the combination of pentobarbital sodium (oral) and paraldehyde (rectal) was employed. However, the use of paraldehyde is not without danger. Kots (28) reported the death of a young parturient patient, which followed the administration of 31 cc. of paraldehyde by the rectal route. The principal pathologic findings were hypostatic congestion and edema of both lungs and marked dilatation of the right side of the heart. Shoor (29) made a similar instance in which autopsy revealed acute pulmonary congestion with edema. Burstein (30) reported analogous findings in two cases; in one instance the route of administration was intravenous, and in the second, oral. His experimental findings following the intravenous injection of paraldehyde in animals revealed similar changes: acute pulmonary edema; areas of hemorrhage in the pulmonary tissue; dilatation of the right side of the heart; and congestion and edema of the remaining viscera.

The barbiturate series has received a modest trial by the rectal route, either as the sole agent or as an addition to rectal anesthetic mixtures. This manner of administration of barbiturates has in general become limited to those instances in which oral ingestion is not suitable (e.g., vomiting). The most convenient preparation is that dispensed in capsules; the presence of small fenestra at either end of the capsule will promote absorption of the drug. Nembutal, secobarbital, etc., act promptly following administration in this manner.

Anesthetic Agents

Either, nitrous oxide and ethylene are perhaps the agents most widely employed for obstetric anesthesia. Vinyl ether was early recommended by Bourne (31) as applicable to this procedure in general practice. He believed that the degree of anesthesia necessary for most obstetric maneuvers would result in no damage to the liver of mother and baby. He devised an apparatus for administration of the agent by the closed method; later, he advocated the use by the open method of a mixture of divinyl ether and ethyl ether in the proportions of one to three. Divinyl ether thus far has found little favor in most clinics.

Within recent years, cyclopropane has steadily replaced the agents formerly used in many obstetric clinics. In 1936, Knight (32) reported his preference for the use of cyclopropane for obstetric procedures, particularly cesarean section. He found that, in general, this agent caused no increase in postpartum bleeding.

Cyclopropane produces no initial stimulation of respiration as do nitrous oxide, ethylene and other. The abundance of oxygen in a cyclopropane-oxygen mixture, however, insures an adequate supply of this substance for the fetus and precludes the necessity of administering larger amounts of oxygen before the cord is severed. Following
the use of relatively large doses of anesthetic and analgesic agents, apnea may easily be effected by smaller proportions of cyclopropane than those ordinarily required for surgical or obstetrical anesthesia (33). The judicious use of cyclopropane will obviate the occurrence of apnea. It has been stated that the concentration of cyclopropane in the fetal blood equals that in the maternal blood in fifteen minutes (34). We have observed a moderate increase in the necessity for resuscitation following the administration of cyclopropane to the mother for periods of longer than average time; no such increase has been observed, however, following anesthesia of average duration. Hershey and Roventine (35) have demonstrated the favorable action of cyclopropane in the presence of acute blood loss. In addition, the increased complement of oxygen possible during administration of cyclopropane is of definite value following severe hemorrhage. Cyclopropane is not contraindicated for the parturient patient with cardiac disease. The ease of induction and the increased proportions of oxygen provide a course of anesthesia which places no undue strain upon an already damaged heart. It is recommended that small amounts of ether be added to the anesthetic mixture in the presence of existent arrhythmias.

Local anesthesia is not widely used for obstetric purposes, but does have several proponents. Glover (36), Bickers (37) and Bunim (38) described the technic of block of the pudendal nerves and local infiltration of the perineum. The degree of relaxation of the outlet following adequate infiltration was excellent; the incidence of lacerations and the necessity for episiotomy were reduced. The fetal and maternal risks were considerably decreased. Rosenfeld (39) recently reported a method of paracervical anesthesia produced by the injection of a local anesthetic solution into the parametrial tissues on either side of the cervix. He stated that relief of the pain of uterine contractions was prompt, without effect on the force of contractions. Delivery was accomplished following additional infiltration of the perineum or pudendal nerves, or by the use of inhalation or spinal anesthetic agents. Beck (40) has presented and evaluated the method of local anesthesia for cesarean section employed at the Long Island College Hospital. This procedure requires gentle handling of the tissues and satisfactory execution of the technic of infiltration. Postoperative complications are infrequent.

In recent years, spinal anesthesia has been employed more frequently for obstetric practice. Cosgrove (41) advocated the use of this form of anesthesia in all obstetrical operations. The sole contraindication to this technic reported by him was arteriosclerosis, particularly that of luetic origin. Batten (42) urged the use of spinal anesthesia for abdominal deliveries. The administration of oxygen to the mother was instrumental in producing a marked increase in oxygen saturation of the fetal blood. Torrie (43) reported the use of spinal anesthesia for 120 cesarean sections. The initial fall in blood pressure which oc-
occurred in a few of his cases reverted within a few minutes to the pre-
operative level. The level of anesthesia was maintained no higher
than the costal margin. He recommended the presence of a well-
trained anesthesiologist.

Continuous spinal anesthesia has been advocated by various authors
for both vaginal and abdominal deliveries. The principal advantages
of this technic are the establishment of satisfactory anesthesia with
small amounts of a drug in dilute solution and the ability to withdraw
the agent rapidly in the event of untoward reaction. The introduction
of the use of ureteral catheters (44) for continuous spinal anesthesia
has stimulated interest in the employment of this technic for relief
of pain during labor. The method is simpler than that for continuous
caudal analgesia. The anatomical contraindications would appear to
be small in number and less absolute. Relief of pain during labor may
be obtained by the administration of procaine in exceedingly dilute
solution; the concentration of procaine must be increased to permit
painless delivery.

Within the past few years, in both the lay and medical press, the
greatest emphasis has been placed upon the development of continuous
caudal analgesia. The initial reports were enthusiastic and confident.
Sufficient experience with the method has now accumulated to temper
the recent reports with discretion and caution (45, 46, 47, 48, 49). As
summarized by Nicodemus and coworkers (47), the advantages are:
the ease and safety of breech deliveries; a lower incidence of stillbirths;
diminished blood loss; less damage to the birth canal; and greater co-
operation of the patient. The principal disadvantages are: increased
length of labor; less intense uterine contractions; loss of expulsive force
of the abdominal muscles; decreased tendency for posterior positions
of the occiput to rotate anteriorly; and an increase in operative inter-
ference. In a discussion of this article, Hingson stated that the length
of labor is increased if the level of analgesia is maintained consistently
at or above the level innervated by the eighth dorsal nerve. This
impression of Nicodemus et al. concerning length of labor is apparently
not generally confirmed by other authors. Two considerations are
paramount: first, due attention must be given to the contraindications
imposed by variation in anatomic structures; second, the presence of
an anesthesiologist specifically trained in execution of the method is
mandatory. The trend of appraisal indicates consignment of the tech-
nic of continuous caudal analgesia to its proper place as one of the
varied agents and methods in vogue at the present time.

Agents and Methods in Use at Hartford Hospital

During the fiscal year of 1945 (October 1, 1944 to October 1, 1945),
4656 anesthetics were given to obstetric patients. Amnesia and anal-
gesia were most often produced by the use of a combination of nembutal,
seconal or sodium amytal with scopolamine. Relief from the pain of labor was obtained in the majority of patients; for those who manifested evidence of pain during the ordeal, the amnesia was frequently of such a great degree that memory of the event was obliterated. There has been an increase in the use of demerol for this purpose. This agent has been administered in almost all instances by the intravenous route regardless of the anticipated time of delivery. Scopolamine was used as an adjuvant. The combination of demerol and scopolamine has proved as satisfactory as the barbiturate-scopolamine medication. The degree of amnesia and of analgesia has been of equal intensity; no significant difference of effect on the newborn infant has been observed.

Continuous caudal analgesia for relief of pain during labor and for eventual delivery was employed in relatively few cases. This number is too small to allow formulation of any conclusions. Concomitant with increase in experience with the method, the production of satisfactory analgesia and anesthesia became more certain. Opinion has been expressed that extended coverage of obstetric anesthesia within this hospital must be afforded by assignment of physician-anesthetists on a full-time basis if sufficient time and personnel are to be available for application of this technique.

Spinal anesthesia by the method of single injection has been used for delivery in a few instances in which general anesthesia was contraindicated. This technique has become increasingly popular in the performance of cesarean section. The employment of decreased doses and the observance of caution in administration of the anesthetic have shown the feasibility of this procedure. No morphine has been administered within four hours of the anticipated time of abdominal delivery. In many cases small amounts of pentothal or cyclopropane with oxygen have been administered to provide light sleep; however, supplemental agents seldom have been used before extraction of the infant from the uterus. It has been noted that the occasional initial fall of blood pressure reverted to the normal or preoperative level in almost all instances immediately following delivery of the infant. Spinal anesthesia has been used more frequently for cesarean sections in the presence of toxaemia. The more favorable operative and postoperative course and the lack of effect on the fetus have warranted continued employment of this method of anesthesia for this procedure.

During the fiscal year of 1945, 83 per cent of cesarean sections were performed with spinal anesthesia as the basic method of choice. The doses of anesthetic drugs employed seldom exceeded 7 mg. of pentothal in 1 per cent concentration and 35 mg. of procaine in 10 per cent concentration. The uppermost level of anesthesia preferred was that at the segment innervated by the eighth dorsal nerve. A small number of sections was performed with continuous spinal anesthesia, employing either the malleable needle or ureteral catheter. In all instances
the agents were administered by a staff anesthetist or a resident anesthetist in training; whenever possible, a second member of the department was at hand to provide any necessary care of the newborn infant. The use of oxygen or active resuscitation was necessary only for certain premature infants or following the administration of large doses of amnesic and analgesic agents to the mother. In general, the vigorous action of the infants attested the relative safety of the method of spinal anesthesia in experienced hands.

Continuous spinal analgesia employing the catheter technic has been briefly explored for relief of pain during labor. Prompt and efficient analgesia was obtained with very dilute solutions of procaine. It was observed that the concentration of procaine must be increased to at least 1 per cent to permit painless delivery. The ease of execution of the technic and the satisfactory results obtained have prompted further investigation of this method.

Within the last ten years, the frequency of employment of cyclopropane for obstetric anesthesia has increased rapidly. At present, cyclopropane is used as the sole agent in more than 50 per cent of the cases in which inhalation anesthetic is administered. The carbon dioxide absorption technic is used in each instance. Induction with this gas is delayed until delivery is imminent. The first plane of the third stage of anesthesia is recommended for normal delivery and for any minor operative procedures which may follow. The addition of ether to the anesthetic mixture is advised when it becomes necessary to provide additional relaxation for versions and extractions or for difficult breech deliveries. Cyclopropane has proved to be an admirable agent for cesarean section. In those cases in which shock is a prominent factor, the cyclopropane-oxygen mixture is of merit in maintenance of blood pressure and more nearly normal values of oxygen saturation of maternal and fetal blood.

The increased employment of the agents for amnesia, analgesia and anesthesia now in active use in this hospital has contributed in a most creditable manner to a decrease in fetal mortality and maternal morbidity. An examination of the table will reveal a steady decrease in both categories. It will be observed that the greatest proportions of neonatal deaths are due to stillbirth, prematurity and maldevelopment. Coincident with the rise in total annual number of deliveries since 1936, the number of stillbirths and neonatal deaths has shown a similar but less pronounced rise. The incidence of fetal deaths has shown little variation from the low level of 1941. The incidence for the fiscal year of 1945 was 2.6 per cent. Further examination of the table will show a steadily decreasing incidence of gross maternal mortality since 1936.

Two other factors must be presented to realize a true perspective of the overall decrease in fetal and maternal mortality. These are the greater incidences of cesarean sections and forceps deliveries.
incidence of sections for 1945 was 7.4 per cent. No fetal or maternal mortality was sustained in this group in the immediate postoperative period. The incidence of forceps deliveries for 1945 was 61 per cent (private service, approximately 85 per cent). In a previous study by Anderson (50) at this hospital it was clearly demonstrated that, as the incidence of forceps and abdominal deliveries increased, the percentage of fetal deaths was lowered. The same report revealed a marked decrease in incidence of intracranial hemorrhage of the newborn.

**Trends in Maternal and Fetal Mortality at the Hartford Hospital**

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<th>Periods in Years</th>
<th>5</th>
<th>1</th>
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<th>1</th>
<th>1</th>
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<tr>
<th>Total women—24 weeks plus</th>
<th>8705</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women delivered and died</td>
<td>1769.0</td>
</tr>
<tr>
<td>Maternal mortality following delivery</td>
<td>21</td>
</tr>
<tr>
<td>Women died per 1000 pregnancies</td>
<td>0.97%</td>
</tr>
<tr>
<td>Gross maternal mortality</td>
<td>0.33%</td>
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<tr>
<td>Incidence of cesarean section</td>
<td>5.0%</td>
</tr>
<tr>
<td>Maternal mortality from cesarean section</td>
<td>0.0%</td>
</tr>
<tr>
<td>Incidence of forceps deliveries (breech and cesareans not included)</td>
<td>21.8%</td>
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</table>

<table>
<thead>
<tr>
<th>Total babies</th>
<th>8851</th>
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<tbody>
<tr>
<td>Neonatal deaths</td>
<td>218</td>
</tr>
<tr>
<td>(Includes premature infants—28 weeks plus, and deformities)</td>
<td>148</td>
</tr>
<tr>
<td>Stillbirths</td>
<td>4.1%</td>
</tr>
<tr>
<td>Fetal loss</td>
<td>3.3%</td>
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</table>

**Summary and Conclusions**

The application, with the greatest safety, of any agent or method to the production of obstetric anesthesia, analgesia and anesthesia requires: (a) proper evaluation of the status of the prospective mother in the antenatal period; (b) close cooperation of obstetrician and anesthetist; and (c) a degree of flexibility of plan of action which will permit alterations of procedure when required.

The opiates have to a great extent been replaced by less depressant drugs, the most popular of which are demerol and selected derivatives of barbituric acid.
Scopolamine has been the adjuvant of choice in most of the combinations of agents recently employed.

The present status of the ultra-short-acting barbiturates and of the drugs commonly administered by the rectal route has been reviewed.

The efficacy of cyclopropane has been demonstrated; it has steadily replaced the more common anesthetics given by inhalation.

Local, regional and spinal anesthesias are advocated by a relatively small number of proponents.

The employment of continuous caudal analgesia has served to demonstrate its usefulness in selected cases. The failure of its general applicability to obstetric practice has become evident.

The agents and methods in use at the present time at the Hartford Hospital have been presented and evaluated.

The more prominent developments have been the marked increase in employment of cyclopropane for obstetric purposes and the growing popularity of spinal anesthesia for the performance of cesarean sections.

Statistical data covering maternal and fetal mortality from 1931 to the present are reported. The major factors contributing to the decrease in both categories have been discussed.

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MEETING OF THE ALBERTA DIVISION OF THE
CANADIAN SOCIETY OF ANESTHETISTS

EDMONTON, ALBERTA

MARCH, 13, 14, AND 15, 1947

"Diaphragmatic Paralysis; Cardiac Arrest During Anesthesia," by Dr. W. H. Cassels, Chicago.

"A Review of the Deaths at the Holy Cross Hospital, Calgary, Alberta," by Dr. W. S. Johns, Calgary.


"Cyclopropane and Intocostrin," by Dr. V. F. Swaneskey, Lethbridge.

"The Specialist in Pre-paid Medicine," by Dr. Bramley Moore, Edmonton.

"The Role of the Sympathetic Nervous System in Anesthesia," by Dr. W. Stewart, Edmonton.

"Heavy Nupercaine Spinal Anesthesia," by Dr. C. Laimhorth, Edmonton.

"Anesthesia in Cardiac Surgery," by Dr. E. H. Watts, Edmonton.